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CSIRO Diving Procedures Manual

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Foreword

CSIRO Diving Procedures Manual



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Foreword

Diving for marine research has had a long history in CSIRO. As early as 1947, A. M. Olsen was using Siebe Gorman standard full-dress diving gear and pumps for his work on the Tasmanian scallop fishery. In 1988, scientists from the CSIRO Marine Laboratories are diving in places as far apart as Papua New Guinea, north-west Australia and southern Tasmania. Over 40 scientists and technical staff are at present qualified to dive

In the 41 years in which CSIRO staff have been diving, no one has been killed or seriously injured whilst undertaking diving duties. That record must not be marred. It is up to all staff members to be alert to the potential dangers of diving, and to maintain the utmost regard for safe diving practices.

This manual has been prepared by Richard McLoughlin (CSIRO Marine Laboratories Diving Master, stationed at Hobart) and Hugh Kirkman (Diving Officer at the Marmion laboratory). Many others have also given help and advice. Particular thanks go to Mr Terry Cummins of PADI Australia for permission to reproduce copyright material in this manual.

As the Chief of the Division is responsible for the safety of staff undertaking diving duties, I am very grateful to all the contributors to this Diving Procedures Manual. It is mandatory that these procedures are followed by everyone who dives for CSIRO.

F. R. Harden Jones
Chief, CSIRO Division of Fisheries

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Introduction

This manual of diving practice has been produced as a result of a meeting of the Diving Officers of the CSIRO Marine Laboratories during May 1988. It is based on the (AMSA) Draft Australian Standard for Scientific Diving (1988) and AIMS Diving Procedures Summary (1987), with reference to the UNESCO Diving Manual (1985).

It is necessary to acknowledge that diving undertaken in CSIRO will sometimes be faced with situations that have not been anticipated in detail by this manual. Thus principles of safety are provided in the manual on the basis that:

- there are general levels of safety that must be maintained
- most situations not covered by this manual will tend to be covered by a combination of, or extrapolation from, the safety procedures suggested for normal diving conditions
- this manual is not meant to be a comprehensive diving reference document; rather, it is a guide for CSIRO employees undertaking diving as part of their research
- the Diving Officer is the final judge of procedures for situations not covered by this manual, and CSIRO staff must defer to the Diving Officer on diving-related matters

The terminology of the Code has not been standardised rigidly, since agreed definitions of many terms do not exist, and it would be arbitrary and cumbersome to attempt this task. However, users of this manual should note the usage of the following terms:

must: there are no circumstances under which this instruction may be ignored

should: normal diving practice requires that this instruction be obeyed but there may be circumstances in which it is appropriate for it to be relaxed

can/may: scientific diving may well benefit from using this technique

should consider: a helpful hint for scientific divers

Section 1 Scope and Definitions

Scope

This manual applies to diving operations using compressed air and snorkel and conducted for scientific research or educational purposes. It stipulates the diving practices to be followed by all CSIRO staff undertaking scientific diving.

Note: This manual does not apply to:

- recreational diving
- diving beyond 50 m depth
- commercial diving
- diving with surface-supply breathing apparatus other than hookah diving
- saturation diving, mixed gas diving, habitat, bell or chamber diving, submersible vehicles or diver lock-out vehicles. For these modes of diving, staff are to refer to the procedures in the documents listed below.

Referenced Documents

The following Australian Standards Association and other publications are referred to in this manual:

- AS 2815 Training and certification of divers
Part 1: SCUBA diving
- AS 3519 Training and certification of recreational divers
Part 1: Minimum entry level SCUBA diving
- AS 2299 Underwater air breathing operations
- Unesco Technical Papers In Marine Science 53. Code of Practice for Scientific Diving (1988)
- AIMS Diving Procedures Summary (June 1987)

Copies of these and other reference documents are available for reference from the Diving Officer.

Definitions

Buddy line: a short length of line with snap clips on each end; used to fix one diver safely to another

Decompression schedule: a schedule or prescribed routine of stoppages at specific depths to be followed by a diver during ascent after being subjected to pressure

Diver: a person trained and experienced in

- (a) diving; to a minimum of AS3519 part 1 (i.e. PADI, FAUI or NAUI open-water diver or equivalent)
- (b) the use of equipment used in diving operations
- and
- (c) first aid related to diving

Float line: a line, with a breaking strength appropriate to the conditions, attached to a float on the surface with sufficient buoyancy to support a diver and his equipment on the surface

Hookah diving: shallow water (<20 m) surface supply diving where the diver uses the second stage of a SCUBA regulator connected by a non-return valve and hose to a compressor or storage cylinders at the surface

Life line: a line of continuous length and free of knots with a breaking strain appropriate to the operation; used to tether a diver

Quick release: able to be immediately released from the secured position by a single operation with one hand

Recompression chamber: a chamber on the surface in which persons may be subjected to pressures equivalent to or greater than those experienced when underwater or at simulated conditions to those experienced on an actual dive

Remote work: any work carried out by CSIRO staff at a site defined as remote by Terms and Conditions (Appendix G)

Submersible air cylinder contents gauge: a submersible pressure gauge attached to a diver's regulator; it is mandatory for all diving operations

Scientific diving: diving performed solely as part of scientific research or educational activities by persons whose sole purpose for diving is to carry out such activities

Self-contained underwater breathing apparatus (SCUBA): open-circuit diving equipment that supplies the wearer with air from cylinders carried by the wearer

SCUBA diving: diving operations in which divers use SCUBA

Snorkel diving: free diving, using mask and snorkel only. The diver swims beneath the surface holding his for her breath.

Surface-supply breathing apparatus: diving equipment that supplies the wearer with compressed air suitable for the depth, through a hose from a compressor or storage cylinders at the surface

Section 2

Personnel and Responsibilities

Chief

The detailed responsibilities of all persons involved in diving operations undertaken under the auspices of CSIRO are set out below.

The **Chief** has overall authority and responsibility for diving in the Division exercised through the **Diving Officers** and in consultation with the **Divisional Diving Officer**. The Chief appoints the Divisional Diving Officer.

Divisional Diving Officer

The **Divisional Diving Officer** has direct access to the **Chief** on matters of diving safety. He or she is responsible to, and represents, the Chief of the Division in all matters related to research diving. The Divisional Diving Officer may also be a Diving Officer.

Diving Officer

The responsibilities of the **Diving Officers** are to:

- ensure that **Divers** are adequately trained and comply with State and/or Commonwealth regulations as required
- certify **Divers** for operations appropriate to their training and medical condition
- maintain a detailed **Diver Register** of all **Divers**, which will include their diving qualifications and annual medical certification
- advise during the planning of diving operations
- ensure that the **Diver Leader** prepares a safe **Dive Plan** for each new diving operation
- ensure that every **Diver** has an annual medical examination
- recommend training for specialised operations
- ensure that divers are trained in the use of emergency and resuscitation equipment
- supervise the use and maintenance of non personal-issue CSIRO diving equipment
- supervise the use of specialist diving equipment
- prohibit the use of equipment considered unsafe
- select appropriate comprehensive diving manuals for the detailed guidance of all diving personnel
- advise on the purchase and procurement of all types of diving equipment
- administer and update, in consultation with the Divisional Diving Officer, the CSIRO Diving Procedures Manual as required
- delegate the duties of Diving Officer to an appointed officer if the need arises, ensuring that the delegate is aware of the responsibilities of the position
- report occupational health and safety incidents or problems to the Occupational Health and Safety committee at each site

The Diving Officer at each regional laboratory is responsible to the Divisional Diving Officer.

Dive Leader

A suitably qualified **Dive Leader** for each diving operation will be approved by the **Diving Officer**. The **Dive Leader** has full responsibility for a diving operation from the time the dive plan is approved by the **Diving Officer**.

The specific responsibilities of the **Dive Leader** are to:

- prepare a safe **Dive Plan** and ensure that it is approved by the **Diving Officer**
- ensure that the **Dive Plan** is understood by the members of the Dive Team
- ensure that all required diving equipment is available at the dive site and is fully operational
- supervise each diving operation and liaise with the **Ship's Master** when appropriate
- ensure that the provisions of the diving manual are followed
- report all accidents or potentially hazardous incidents (in writing) to the **Diving Officer** at the completion of diving operations
- ensure that all required medical and emergency equipment detailed in appendixes D and E is available at the dive site
- know the emergency radio procedures, and have a list of telephone numbers of diving medical doctors and facilities for that region

Research Divers

All **Divers** taking part in diving operations under the auspices of CSIRO must be appropriately trained and listed in the **Diver Register** maintained by the **Diving Officer**. To be on the **Diver Register** they must have passed an annual diving medical, and have appropriate diver qualifications (see p.3, "diver"). *This requirement applies whether or not the diver is employed by CSIRO.*

The responsibilities of the **Diver** are to :

- ensure that he or she is familiar with the diving procedures as described in this manual, or as recommended by the **Diving Officer**
- ensure that he or she is medically and physically fit for each dive
- comply with the instructions of the **Dive Leader**
- maintain an up-to-date **Log Book** of all dives (appendix B)
- maintain and repair diving equipment issued to him or her, and keep a record of purchases, repairs and maintenance of all personal-issue equipment
- understand fully, and agree to, the **Dive Plan** prepared by the **Dive Leader**

Boat Handler

The **Small-boat Handler** will be identified on the dive plan, and is a key member of the dive team.

The responsibilities of the **Boat Handler** are to:

- ensure boat safety equipment is onboard and fully operational and that fuel supplies are adequate
- stow all diving, safety and other equipment properly
- drive the boat to and from the dive site and maintain position at the dive site, usually by anchoring securely
- maintain radio communication with the mother ship, or shore base (if applicable)
- maintain a constant vigil during diving operations for **Divers** surfacing at any distance from the boat, particularly near the planned end of a dive
- assist in the recovery of **Divers** and all equipment and samples from the water
- be prepared to move the boat in order to render assistance to **Divers** surfacing in difficulties some distance from the anchored position
- ensure that a diving flag is prominently displayed whilst divers are in the water.

The **Boat Handler** must not:

- leave the boat at any time, other than in an emergency, to swim or snorkel
- carry out any activities that may divert his or her attention from the responsibilities set out above

The **Diving Officer** may, at his or her discretion, waive the need for a boat handler after discussions with the Dive Leader, and before submitting the dive plan. In this case, the dive plan will specify extra precautions to be taken

Standby Diver

A **Standby Diver** must be a diver qualified as a Research Diver (see previous page) and dressed to the extent that the diver can enter the water without delay to go to the aid of a distressed diver. The standby diver may act as a diver's tender.

A standby diver must be present at a dive site during SCUBA diving operations

- requiring a decompression schedule
- at depths exceeding 30 m
- where there is danger of diver entrapment
- where required by the **Diving Officer**
- where there is a danger of attack by predatory marine animals

Section 3 Equipment for Diving

Equipment Standards and Maintenance

Each member of the diving team must know the capabilities and limitations of any equipment to be used. The dive leader must select appropriate equipment, based on the work site conditions and the dive plan. Equipment must not be altered, modified, or changed in any way that might impair its safe and efficient operation.

All diving equipment, including cylinders, regulators, and all accessories necessary for the safe conduct of the diving operation must be:

- of approved design, sound construction, adequate strength, free from any defect, and maintained in a condition that will ensure its continued operation for the purpose and depths for which it was originally designed or subsequently used
- of the standard required by AS 2299
- examined, tested, overhauled and repaired in accordance with the manufacturer's recommendations and used in accordance with AS 2299

Records of non-personal issue equipment maintenance and testing shall be kept by the Diving Officer for at least two years. Records of 'personal-issue' equipment maintenance and testing shall be kept by the Diver for at least two years.

Checking of Gauges and Metering Equipment

Gauges and metering equipment shall be serviced at least every 12 months. Any malfunction must be rectified without delay. If gauges and metering equipment are removed from service, such equipment shall be returned to the Diving Officer.

Compressor and System Requirements

All cylinders, fixtures, and fittings used in connection with compressors must meet the requirements of AS 2299. Compressor and hookah systems used to supply air to a diver must meet the requirements of AS 2299. Compressed air used in diving must conform to the requirements of AS 2299.

Diving Equipment

It is a policy that all equipment necessary for any task be supplied by CSIRO. Therefore privately owned diving equipment should not be used for diving operations. Each diver shall use the following equipment and that equipment specified in Section 3.4 appropriate to the conditions:

- open-circuit SCUBA, complete with demand regulator and cylinder with quick-release harness, or a hookah system
- face mask
- swimming fins
- snorkel for surface swimming
- suitable knife
- weight belt or weight jacket with a quick-release closure
- submersible pressure gauge for measuring remaining air pressure in cylinder(s)

- wetsuit or protective clothing appropriate to the condition of work and the temperature of the water
- buoyancy compensator of an approved design that is inflatable by mouth and with a compressed air cylinder
- watch/elapsed-time indicator
- depth gauge

Section 4

Diving Procedures

Buddy divers

Diving procedures must be carried out according to the provisions of this document and with due consideration of the more detailed information in the UNESCO diving manual or as recommended by the **Diving Officer**. It must always be remembered that many of the research locations must be considered *remote* from search and rescue, medical and recompression facilities.

Free-swimming buddy divers shall endeavour to maintain effective two-way communication with each other at all times while in the water and be ready to render assistance in case of need.

In conditions where underwater visibility is less than 50 cm, diving shall be performed with a buddy line unless there is danger of entanglement as part of the work. In such a case, the Dive Plan will specify extra precautions to take account of the restricted visibility and lack of a buddy line.

Tethered divers

When SCUBA diving is done in a tethered mode, the diver shall be *either* secured by a lifeline and tended by a diver's tender, *or* secured to a float line, and the float observed by a diver's tender.

A diver tethered by a life line must maintain effective two-way communication with the diver's tender at all times.

Where a diver is tethered by a float line the diver's tender must have, and maintain, the ability to recall the diver at all times.

Normal Diving Procedures (0–20 metres depth)

Divers must:

- carry out the procedures specified in the CSIRO Diving Procedures Manual within the constraints specified in the **Dive Plan**
- operate in groups of 2 or 3, never singly (unless surface tendered or tethered with lifeline) nor in a group of 4 or more. Before beginning the dive, each DIVER must thoroughly check all diving equipment he or she intends to use
- tell the **Boat Handler**, **Standby Diver** or **Diver's Tender** (as appropriate) how long they propose to stay submerged and, as accurately as possible, where they will be
- be familiar with the Diving Science and Technology Corporation tables (1987) (Appendix A). All diving should be carried out in accordance with this table, as agreed with the **Diving Officer** and stated on the **Dive Plan**. Procedures for repeat dives are included in these tables.

The **Dive Leader** must be present at the dive site and must have briefed all personnel before the dive on the procedures to be adopted when Divers are overdue, and on procedures to be adopted when contact with the divers is lost.

During diving operations, **Divers must not:**

- give air to snorkellers underwater
- spearfish or collect marine organisms except for collection of scientific specimens as outlined on the dive plan
- use their buoyancy compensators to lift heavy objects

The **Boat Handler, standby diver or observer** must assist in recovering divers and their equipment and in particular be ready to move to divers surfacing some distance away should they appear to need help.

Night Dives

In addition to **Normal Diving Procedures**, the following procedures must be followed for a **Night Dive**:

- the **Dive Site** should be marked during daylight before the **Night Dive**, using an anchored buoy with an activated **Cyalume** (or other suitable light) attached
- an activated **Cyalume** (or other suitable light) must be attached to the **Diver** Each diver must carry an operational **Diving Light** and a whistle.
- before entering the water, each **Diver** must thoroughly check all diving equipment he or she intends to use
- novice night-divers should be teamed with experienced divers
- decompression time *must not* be incurred on night dives
- **Drift Diving must not** be carried out at night
- diver teams operating at night from a boat must have a standby diver and a boat handler
- night diving from shore must include an observer or standby diver. Two flashing aligned lights must be set up on the shore.

Deep Diving (greater than 20 m depth)

No dive shall be carried out at depths over 20 m unless each diver is:

- trained and experienced to a level of AS 2815 Part 1,
- is equipped with an octopus regulator, and
- has, within the previous 10 days, undertaken one or more work-up dives between 15 and 20 m

A spare cylinder and regulator shall be carried with the dive team, with provision made for rapid access to the scuba unit if it is required.

Decompression dives must be planned in consultation with the **Diving Officer**. Since the recommended dive tables (Appendix A) are repetitive dive tables only, the **Diving Officer** will recommend a set of decompression tables to be followed. Divers should consider using a submersible dive computer (eg. Suunto SME-ML) for deep diving when there is uncertainty about deepest depths, bottom times etc.

Pre-dive

The **Dive Leader** must ascertain that special deep diving equipment as required by the **Diving Officer** and emergency oxygen therapy equipment plus full oxygen cylinder(s) are available and are fully operational.

Full details of any planned or expected in-water decompression schedules must be described on the Dive Plan.

No dives deeper than 50 metres will be allowed at any time.

Snorkelling

Free or snorkel diving requires a moderate to high level of health and fitness. Problems faced by snorkel divers include hypothermia, entanglement, disorientation and exhaustion, as well as problems peculiar to snorkel diving such as hyperventilation and shallow-water blackout.

The minimum requirements for work-related snorkel diving by CSIRO staff are:

- an annual diving medical examination
- minimum swimming ability of
 - (1) 200 m continuous surface swimming
 - (2) 10 minutes treading water without flotation or swimming aids
- a buddy *or* a continuous observer present at all times
- a dive plan

Towed Divers

Divers using a snorkel or SCUBA, when being towed by a boat and using either sledges, sleds, 'manta-boards' or other towed devices:

- *should* be attached to a float line equal to or greater than the water depth
- *must* be able to release themselves from the towed device at any time
- *should* have both a boat handler and an observer experienced in such underwater towing operations
- *should* have a demand valve safety strap

Antarctic/Under-ice Diving

All CSIRO staff undertaking diving operations in the Antarctic must refer to, and abide by, the procedures detailed in the "Handbook for ANARE Diving Operations" and the directions of the Antarctic Division Diving Officer.

Diving under Large Vessels

Where divers are working immediately underneath, or upon the hull of, a large vessel

- the ship's master must be given complete details of the dive operation
- the ship's engineer must shut down any propulsion systems completely, and remain at the control panel for the duration of the dive to ensure that no propellers are operated. This may require shutting down automatic systems
- a standby diver must be in attendance
- a small boat shall be launched for recovery of the divers, unless it is certain that the divers can safely and quickly be recovered back on board
- all ship's vents (e.g. bilge water, toilets) must be closed for the duration of the dive
- divers should avoid the stern and bow sections of the ship

Mid-ocean (Blue Water) Diving

Diving in the open ocean must be done from a large ship, which transports the diving team to the dive site, with a manned small boat tending the divers in the water. The operational procedures are:

- mid-ocean diving operations must be carried out with a small boat located on the dive site, and fastened to a shot line of greater length than the planned maximum depth of the dive
- the shot line *must not* be weighted in excess of 2 kg if divers are attached to it by short tethers
- the small dive boat must have a **Divers' Tender** and/or a **Small Boat Handler** on board
- the mother ship and small dive boat should be in communication at all times and the mother ship must not lose sight of the small dive boat
- the dive boat *must* have flares and emergency oxygen on board in case of an emergency

Dive leaders should consult the UNESCO Code of Practice for Scientific Diving (page 94) for further details of blue-water diving before completing the **Dive Plan**.

Post-dive

Divers should anticipate symptoms of decompression sickness for up to 2 days after a dive involving **Decompression**. They must not travel by air nor engage in exhausting athletic activities within 4 hours of a single non-decompression dive or any repetitive dive, or within 24 hours of a single decompression dive.

Divers must complete a **Log Book** entry for each separate dive at the end of the day's diving and report any problems or incidents to the **Dive Leader**.

Section 5

Diving Emergencies

Action in Diving Emergencies

Common causes of diving emergencies are decompression sickness ("bends"), lung expansion injury or direct physical injury underwater. The latter may precipitate the others by causing very rapid ascent. Details of decompression sickness and lung expansion injury (with resultant arterial air embolism) are given in Section 11 of the UNESCO Code of Practice for Scientific Diving.

The following actions must be taken during and immediately after a diving emergency, and with reference to the **Emergency Procedures Flowchart** (Appendix E):

- remove the diver from the water, or danger, and assist the injured person(s) *immediately* as required (see section 5.2).
- recall all divers or swimmers to the boat or shore. If decompression would normally be required, the **Dive Leader** should decide whether the risk of deterioration in the injured person(s) condition is sufficient to justify abbreviating decompression, with the possible requirement for recompression of other divers later
- recover as much equipment as possible after the emergency and *keep it apart* from other equipment so that it can be examined by experts. The **Dive Leader** may decide not to recover items if to do so would be unsafe or cause undue delay
- make sure that other members of the diving team are not at risk and that all divers are present
- ensure that, in the haste of the emergency, no equipment has been left in a dangerous condition
- proceed as fast as possible to the nearest port, hospital or vacant recompression chamber as dictated by the circumstances. Radio the appropriate emergency authorities with details of the medical problem and relevant medical history of the injured person(s).
- complete the injured diver's **Diver's Log Book**. Immediately note the details of the dive during which the emergency occurred so that the length of time the **Diver** was in the water and the applicable decompression time can be determined. Such a record is invaluable for constructing a therapeutic profile.
- try to ensure that the **Diver's Log Book** is available for the doctor, particularly if recompression is required. The details of the **Diver's** last diving medical examination may also be useful if they can be obtained quickly.
- in the case of a fatality or serious accident involving recompression and/or hospitalisation, the **Dive Leader** must notify the **Divisional Diving Officer** as soon as practicable
- when the immediate emergency has passed, and all necessary steps have been taken to assist the casualty, a full record of the incident must be compiled. The **Dive Leader** may have time while the boat is returning to shore or mothership to start making notes, obtain details from other **Divers**, record exact times, etc.
- remember that the buddy of a **Diver** who develops symptoms of decompression sickness, even on a dive apparently carried out according to the tables, may also develop symptoms later and require recompression

Emergency Therapy

Surface oxygen-therapy

Provision of 100% oxygen by facemask on the surface is the recommended emergency first aid measure for both decompression sickness and air embolism. It should be administered immediately, and as necessary during transfer to hospital or recompression facilities.

Oxy-Viva or other CSIRO approved-equipment for this purpose is available at all CSIRO Marine Laboratories. All divers must be familiar with its use.

Accident Reports

Minor accidents, near-accidents and diving problems

Problems of this nature are to be noted in the **Diver's Log Book** and where appropriate a complete report is to be lodged with the **Diving Officer** to minimise the likelihood of a recurrence. This report should be passed on to the OH & S committee.

Accidents that do not result in permanent injury

Such accidents include large flesh wounds, broken bones, concussion and other injuries that would debar the **Diver** from normal work or diving for a period. The accident should be reported in full to the **Diving Officer**, who will consider whether there is any evidence of negligence or unsafe diving practice and report as appropriate to the **Divisional Diving Officer** and the local safety officer, with the aim of decreasing the likelihood of recurrence of such an accident. Before diving again, the injured **Diver** should have a full medical examination. A CSIRO "Occupational Injury, Illness or Incident Report" (form CS/S8/3) should be completed by the injured staff member.

Accidents resulting in serious injury, death, or permanent inability to dive

The fullest possible report must be compiled by the **Dive Leader** and submitted to the **Diving Officer**. This must be submitted, with the **Diving Officer's** comments and recommendations, to the **Divisional Diving Officer**, who will report to the Chief. These incidents will then be investigated in accordance with CSIRO Policy Circular 87/12.

Section 6 Infringements

If any infringements of the provisions set out in this document are reported to the **Diving Officer**, they must first be verified, then reported immediately to the **Chief or OIC** in writing.

The **Chief** may decide that any of the following actions are appropriate.

- In the case of a minor infringement, the **Chief or OIC** may instruct the **Diving Officer** to discuss the matter with the **Dive Leader** and **Diver(s)** involved, with a view to preventing repetition.
- The **Chief** may institute an **Internal Inquiry** into the incident and take whatever action he or she deems necessary following the **Report** of that **Inquiry**.
- The **Chief** may take any other action deemed necessary, particularly in conjunction with **External Inquiries** necessitated by serious injury or death of personnel.

Section 7 Internal Inquiries

The **Director**, in consultation with the **Chief**, will institute an **Internal Inquiry** into any diving-related incident involving death or serious injury. An **Internal Inquiry** should normally be carried out by a committee comprising the **Diving Officer**, the **Divisional Safety Officer**, and any other **CSIRO** personnel appointed by the **Director** or **Chief**. The **Divisional Diving Officer** is always an *ex officio* member of the Committee.

The **Internal Inquiry** should be conducted as follows.

- specific **Terms of Reference** appropriate to the incident should be established by the **Chief**, and approved by the **Director**
- all relevant information, both written and verbal, should be gathered from all persons involved in the incident, and from any other relevant source
- the **Internal Inquiry** committee should compile a complete description of the incident and make any recommendations it considers necessary. The description of the incident and recommendations should be communicated to the **Director** via the **Chief** in the form of a **Report**. Any unresolved differences of opinion should be noted in the report.
- the **Internal Inquiry** may recommend to the **Chief** additional training or the adjustment or cancellation of the **Diver Certification** of any of the personnel involved. It may also recommend that the circumstances warrant harsher penalties, but implementation of these must be at the discretion of the **Chief**.

Appendix A Recommended Repetitive Diving Tables

START

DEPTH (metres) ►

PRESSURE GROUP

43

NO-DECOMPRE

**METRIC TABLE 1
NO-DECOMPRESSION
LIMITS AND GROUP
DESIGNATION TABLE**

*10.5m actual; 10m used for easy depth gauge monitoring.



RECREATIONAL DIVE PLANNER™

DIVING SCIENCE & TECHNOLOGY CORP.

METRIC TABLE
SURFACE INTERVAL
CREDIT TABLE

START OF SURFACE INTERVAL

CONTINUE ON OTHER SIDE

PRESSURE GROUP AT END OF SURFACE INTERVAL

DEPTH (metres)

Z Y X W V U T S R Q P O N M L K J I H G F E D C B A

10	219	199	178	160	145	133	122	112	104	95	88	82	75	70	64	59	54	50	45	41	37	34	30	26	20	10
12	147	134	125	116	108	101	94	88	82	76	71	66	62	57	53	49	45	42	38	35	32	29	26	23	17	9
14	98	92	87	82	77	73	68	64	61	57	53	50	47	43	40	37	35	32	29	27	24	22	19	15	8	
16		72	70	67	63	60	56	53	50	48	45	42	39	37	34	32	29	27	25	23	21	19	17	13	7	
18		56	55		53	51	48	46	43	41	39	36	34	32	30	28	26	24	22	20	18	16	15	11	6	
20					45	44	42	40	38	36	34	32	30	28	26	25	23	21	20	18	16	15	13	10	6	
22							37	36	34	32	30	29	27	25	24	22	21	19	18	16	15	13	12	9	5	
25									29	28	26	25	23	22	21	19	18	17	15	14	13	11	10	8	4	
30														20	19	17	16	15	14	13	12	11	10	9	6	3
35																14	13	12	11	10	9	8	7	5	3	
40																			9	8	7	7	6	5	2	7

*10.5m actual; 10m used for easy depth gauge monitoring

The Recreational Dive Planner is designed specifically for planning recreational (no-decompression) dives on air only. Do not attempt to use it for planning decompression dives.

Safety Stops — A safety stop for 3 mins at 5 m is required any time the diver comes within 3 pressure groups of a no-decompression limit, and for any dive to a depth of 30 m or greater.

Emergency Decompression — If a no-decompression limit is exceeded by no more than 5 mins, an 8-min decompression stop at 5 m is mandatory. Upon surfacing, the diver must remain out of the water for at least 6 hrs prior to making another dive. If a no-decompression limit is exceeded by more than 5 mins, a 5-m decompression stop of no less than 15 mins is urged (air supply permitting). Upon surfacing, the diver must remain out of the water for at least 24 hrs prior to making another dive.

Flying After Diving Procedures — For a single no-decompression dive with less than 1 hr of bottom time, wait a minimum of 4 hrs; for a single no-decompression dive with more than 1 hr of bottom time or after any repetitive dive, wait a minimum of 12 hrs; for any dive requiring emergency decompression, wait a minimum of 24 hrs. When possible, however, a 24-hr wait is generally recommended in any case.

Diving at Altitude — This planner is not designed for use at altitudes greater than 300 m above sea level.

Special Rules for Multiple Dives

Special rules for multiple dives
If you are planning 3 or more dives

first dive, if your ending pressure group after any dive is W or X, the minimum surface interval between all subsequent dives is 1 hr. If your ending pressure group after any dive is Y or Z, the minimum surface interval between all subsequent dives is 3 hrs.

Note: Since little is presently known about the physiological effects of multiple dives over multiple days, divers are wise to make fewer dives and limit their exposure toward the end of a multi-day dive series.

General Rules

- Ascend from all dives at a rate not to exceed 18 m per min.
- When planning a dive in cold water or under conditions which might be strenuous, plan the dive assuming the depth is 4 m deeper than actual.

- Plan repetitive dives so each successive dive is to a shallower depth.
- Never exceed the limits of this planner and whenever possible avoid diving to the limits of the planner.

■ White area indicates *Residual Nitrogen Time (RNT)* in minutes and is to be added to *Actual Bottom Time (ABT)*.

■ Blue area indicates adjusted no-decompression limits. *Actual Bottom Time (ABT)* should not exceed this number.

Residual Nitrogen Time (RNT)
Actual Bottom Time (ABT)

= Total Bottom Time (TBT)

Test	Time (s)	Distance (m)	Speed (m/s)	Acceleration (m/s ²)
1	10.0	10.0	1.00	0.00
2	20.0	40.0	2.00	0.00
3	30.0	90.0	3.00	0.00
4	40.0	160.0	4.00	0.00
5	50.0	250.0	5.00	0.00
6	60.0	360.0	6.00	0.00
7	70.0	490.0	7.00	0.00
8	80.0	640.0	8.00	0.00
9	90.0	810.0	9.00	0.00
10	100.0	1000.0	10.00	0.00

CAUTION: This product for use only by certified divers or individuals under the supervision of a certified scuba instructor. Misuse of this product may result in serious injury or death. If you are unsure as to how to properly use this product, consult a certified scuba instructor.

PRODUCT NO. 60055



No.

Weather: _____ Sea: _____

Snorkel ☐ Shore ☐ Cavern ☐ Other _____

Scuba ☐ Pier ☐ Boat ☐ Boat name: _____

Decompression/
repetitive dive notes: _____

.....

.....

.....

.....

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Camera _____
Equipment: _____

Film: _____ Roll #: _____ Exposures: _____

Results: _____

This Year		Total		Verifying Signature
Dives	Hours	Dives	Hours	

Verifying Signature

Appendix C Dive Plan

CSIRO Division of Fisheries Dive Plan

Proposed Dives

Date

Place

DIVE LEADER

Other divers (include non-CSIRO personnel)

Detailed description of dive program (include entry and exit locations, depths and durations of each dive.
Attach sheet if insufficient space.)

Nature of work to be carried out

Transport to dive site

Vessel and operator (if applicable)

Any special permits required? (specify)

Hazard and accident management plans (specify)

Diving flag (mandatory)

Signature of dive leader

date

Subprogram

Diving Officer's signature

date

Appendix D Medical Standards

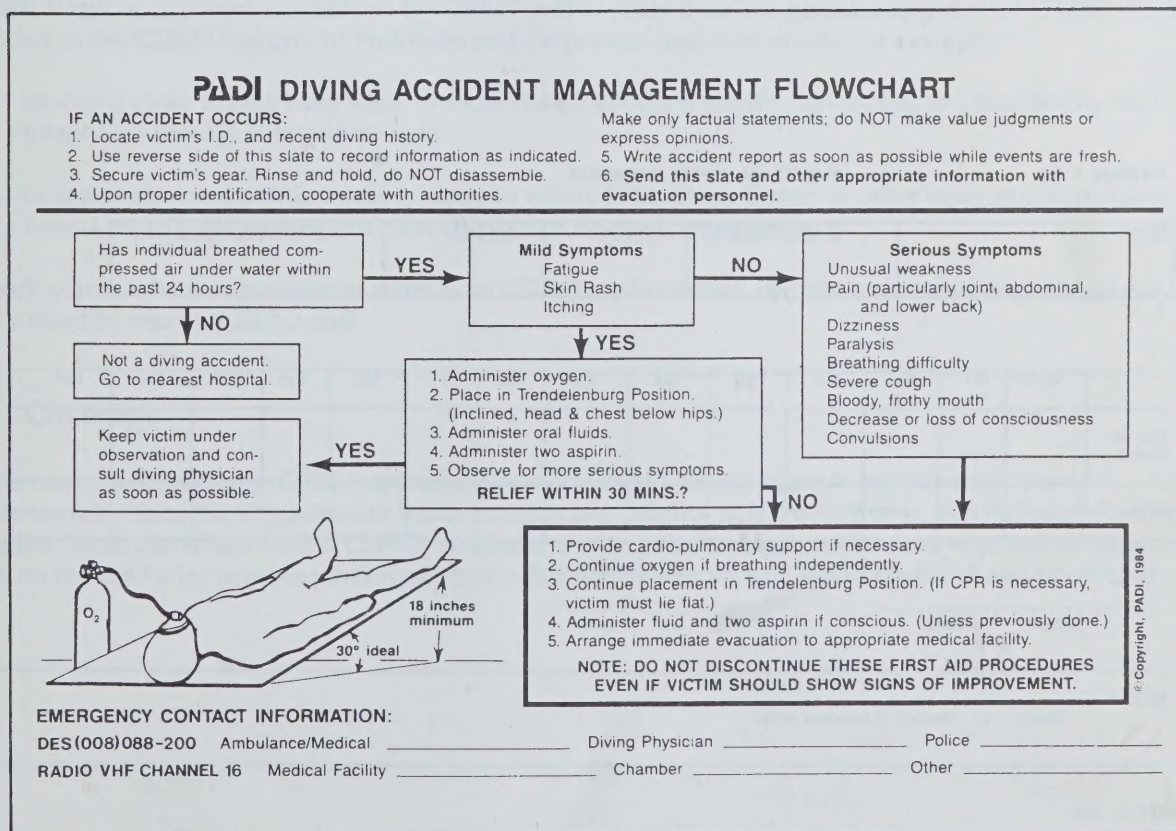
- (a) Prior to employment with CSIRO, staff required to undertake diving duties will be examined by a Commonwealth Medical Officer (CMO) in accordance with the requirements set out in the CMO handbook. These include a medical examination as set out in AS2299 Appendix A, except that skeletal (long bone) x-rays need not be performed. If the CMO is not qualified to assess staff for diving duties, an approved practitioner must conduct the AS2299 examination, and the staff member must present the results of his or her visit to the CMO. Details of the type of diving duties to be undertaken are to be set out by the staff member's supervisor on form CS/S69/1 'Medical Assessment', which will accompany the applicant on his or her visit to the CMO.
- (b) AS2299 medical examination form
- (c) Additional medical examinations as required or requested by
- The examining medical officer
 - The Diving Officer
 - The Diver

Appendix E Emergency Equipment; Procedures Flowchart

Appendix E (i) Emergency Equipment

- 1 To be carried by each dive team to the dive site
 - oxy-viva or equivalent CSIRO approved emergency oxygen therapy equipment.
 - first aid kit (e.g. St. Johns Ambulance boating first aid kit or equivalent)
- 2 Additional emergency equipment for remote locations
 - spare oxygen cylinder for oxy-viva
 - two-way radio facilities, of sufficient range to notify another vessel or shore station of an emergency

Appendix E (ii) Procedures Flowchart



Appendix F Diving Officer's Register

(a) Diving Officer's Register

Diver's Name	Classification	Division	Location
--------------	----------------	----------	----------

Qualification	Date of issue of qualification	Date of last medical	Diver's signature re manual	Dive Officer's comments
---------------	--------------------------------	----------------------	-----------------------------	-------------------------

APPENDIX F (b) REQUEST FOR DIVING ALLOWANCES

Name	Classification	Division	Location	Fortnight ending
------	----------------	----------	----------	------------------

	Thurs	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed
Day of month														
Dive														

.....
Signed (Diver)

...../...../.....
Date

NOTES:

Codes 1. Diving Allowance = DV

Office Use:

Dive Officer:

checked by

Pay No.

Appendix G CSIRO Terms and Conditions — Remote Areas

Guidelines on OHS Aspects of Field Work in Remote Locations

Policy Circular No 87/26 (30 October 1987)

Introduction

The following guidelines are based on the current practices of a number of CSIRO Divisions and other Commonwealth and State Government authorities.

While it is impossible to anticipate all possible eventualities likely to occur in the field, it is the duty of the Organisation and its staff to take a balanced view of risks and their likely outcome and ensure that adequate physical and administrative precautions are taken.

Mishaps or accidents in remote locations can lead to more serious injury and disruption to research activities than those that occur at base. These losses alone justify increased expenditure to ensure that appropriate equipment is provided, and realistic schedules kept.

Definitions

For the purposes of these guidelines, **Remote Work** is defined both in terms of distance and inaccessibility. They are of equal importance in detection of, and recovery from, any medical problems or accidents.

Remote Work is any work carried out by CSIRO staff at other than at a permanently staffed CSIRO site (as included in the CSIRO Register of Buildings and Properties) and that entails, for example:

- working away from a busy road, or more than 5 km from a town, farmhouse or other facility with telephone or radio communications
- in areas where very little traffic is likely or where hills, dense timber or other topographic features would make it difficult to summon help either from a farm or town.

In work places where organisations other than CSIRO are in control, the minimum requirements set out in this Policy must be met for CSIRO staff.

Coverage

All persons participating in CSIRO-sponsored or recognised field work are to comply with these requirements. Since the Organisation has a common law liability to all participants, this includes visiting scientists (from elsewhere within CSIRO, Australia or overseas), trainees, contractors required to carry out work on the field trip, persons participating in collaborative ventures or visitors (official and unofficial).

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